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ABSTRACT

Findings of a study that examined whether high school size significantly supplemented factors identified as contributing to educational achievement and ability are presented in this paper. In general, two divergent viewpoints concerning school size have been argued. One view holds that large schools are better than small schools because they offer students broader and richer curricula, larger libraries, and better facilities; the other view argues that small schools are better because they offer students more individualized attention. This study explored the effect of school size on Walberg's model of educational productivity (1984). Variables from the questionnaires used in the National Longitudinal Study (NLS) of the High School Class of 1972 were matched to the productivity factors identified by Walberg. The subjects were 1,539 senior high school students from the original 1972 study who were reexamined in 1979. The subjects were asked to take a test of ability consisting of selected mathematics and vocabulary questions from the 1972 test. Results indicated significant support for Walberg's productivity factors, which include ability, age, motivation, instructional quality and quantity, and home and classroom environments. School size was significant for educational attainment. The data argue that school size at the high school level is not an issue in educational ability and reaffirm the importance of the home environment in contributing to learning productivity. Three tables are included. (Contains 11 references.) (Author/LMI)

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ABSTRACT

The purpose of this study was to determine whether high school size significantly supplemented factors identified as contributing to educational achievement and ability. In general, two divergent viewpoints concerning school size have been argued. One view argues that large schools are better than small schools because they offer students broader and richer curriculums, larger libraries, and better physical plants. The other view argues that small schools are better because they offer students more individualized attention that allows for additional enrichment programs. This research explored the effect of school size on Walberg's model of educational productivity (1984). Variables from the questionnaires implemented in the National Longitudinal Study (NLS) of the High School Class of 1972 were matched to the productivity factors identified by Walberg (1984). The subjects were 1539 senior high school students from the original 1972 study who were reexamined in 1979. The subjects were asked to take a test of ability consisting of selected mathematics and vocabulary questions from the 1972 test. Subjects also reported on their levels of educational achievement. Results showed significant support for Walberg's productivity factors. School size was significant for educational attainment. The data argues that school size, at least at the high school level, is not an issue in educational ability. The results reaffirm the importance of the home environmental factor in learning productivity.

School Size Effects on Educational Attainment and Ability

This research explored the effects of high school size on several measures of educational productivity. The basic question we set out to answer concerns whether school size effects educational attainment and ability . In many communities today school boards are making decisions on closing schools and consolidating districts primarily on economic and social issues rather than on the impact of student achievement. Recently, pressure has been placed on school boards for consolidation based on claims that larger schools actually increase student achievement although there has been little data to substantiate such claims. (Education Week, 1985). Even if we accept this premise we might still question whether the effects of larger schools result in the more significant educational attainments that appear years later.

In general, two divergent viewpoints concerning school size have been argued. One side proposes that large schools are better because they offer students broader and richer curricula, larger libraries, and better equipped physical plants. (Conant,1959) The other side argues that small schools are better because they offer students more individualized attention, program enrichment, and more opportunity for school/home–student/teacher communication.(Turner and Thrasher,1970)

Method

Subjects

The subjects were 1539 senior high school students from an original sample of 2308 first examined in 1972 and again in 1979. There were 837 males and 702 females. The original group represented 856 public, private and parochial schools. The sample represented the full range of the variables under study.

Instruments

In the base year (1972) students were administered a 231 item Test Book consisting of six subtests measuring both verbal and nonverbal ability. The subjects were allowed 69 minutes to complete the test. The subjects were retested in 1979 with a twenty minute subset of questions taken from this test book. Of the six tests in the original battery, only the vocabulary and mathematics sections were used in the post-test. School questionnaires were completed by participants and school record information forms were completed by school counselors.

Procedure

Based on Walberg's (1984) research into learning determinants, nine factors have been shown as powerful and consistent influences on affective, behavioral, and cognitive development. For this study ability, age, motivation, quality of instruction, quantity of instruction, home and classroom environment were selected as predictors of the outcome factors of educational ability and achievement. (Table 1.) The reliabilities of the scaled measures chosen were: ability in 1972 (.70), achievement (.84), motivation (.54), quality (.70), size of school (.96), classroom (.65), home (.55). (Table 1.) Reliabilities were found to be stable for both females and males. A slight increase was noted in the home factor for males (.58). These seven factors plus the measures for quantity of instruction and development were regressed on the measure for educational ability of 1979. The additional factors of school size and achievement were added to these input variables. These nine factors plus the measure for educational ability in 1979 were regressed on the measure for educational attainment of 1979. Backward regression procedure was used to determine which circumstances were predictive of educational attainment and ability. The same procedure was followed in examining ability and achievement in 1972. Math and vocabulary ability were used as dependent variables in the subsequent equations. Gender differences on educational attainment and ability were also explored.

Results

For the ability equation, the stepwise process eliminated motivation, development, quality, quantity of instruction, size and classroom, leaving the home, ability and achievement as the predictors. For the attainment equation, the stepwise process eliminated motivation, home and classroom, leaving ability 1972 and 1979, development, quality, school size, quantity of instruction, and 1972 achievement as significant.

In the first equation, 38.1% of the variance in the 1979 ability outcome was explained by the measures of ability, home, and achievement at a significance level of less than or equal to .01. In the second equation, 13.8% of the variance in educational attainment by the measures of ability 1972 and 1979, development, quality, school size, quantity of instruction and achievement in 1972 at a significance of less than .05. (Table 3.)

The percentage of explained variance was anticipated to be somewhat low as the selection of high school seniors represented a homogeneous measure of academic accomplishment restricting the range of variance in the outcome of educational attainment. If this sample included all high school grads then the measure of educational attainment seven years later would include more subjects enrolled in two year colleges and technical schools. Also included would be those students who dropped out before becoming seniors. The result would be reflected in greater variance in educational attainment.

All independent variables showed positive relationships with outcome variables with the exception of the measure for development. This suggests that, in general, younger subjects had higher ability and achievement. Perhaps older subjects were retained a grade because of poor achievement and/or younger students may have skipped a grade due to superior achievement. Results were broken out by location of school; rural, suburban, and urban. For suburban schools (N=341), 46.1% of the variance in educational ability was represented by the home; quantity of instruction, and tested 1972 ability. In attainment, 26% of the variance was represented by quantity of instruction, development, quality of instruction and 1972 ability. For urban schools (N=271), 11% of the variance in 1979 educational attainment was represented by development, 1972 achievement, and quantity of instruction. For rural schools (N=275), 16.3% of the variance in attainment was represented by quantity of instruction, development, and 1972 achievement and 1972 ability.

School size was not significant in the 1972 and 1979 math ability equations for females or males. However school size was significant for both females and males in the 1979 vocabulary ability measure and for females in the 1972 vocabulary ability measure. For all subjects in the sample quantity of instruction was significant in predicting math ability in 1972 and 1979. Development (age in months) was a significant predictor in 1979 educational attainment and for all 1972 and 1979 math and vocabulary ability measures for both females and males.

For females 23% of the variance in 1979 math ability was attributed to 1972 ability, 1972 achievement, development, and quantity of instruction. In this regression the beta value for achievement was .31 and for ability .177. For female subjects quality of instruction was significant for vocabulary ability in both 1972 and 1979.

School size was significant for 1979 educational attainment for males but not females. For the male subjects 41% of the variance in the 1979 ability measure was explained by achievement in 1972, quantity of instruction, and ability in 1972. (Table 4.) Approximately 16% of the variance in vocabulary ability in 1979 was explained by the measures of school size, development, 1972 achievement, and 1972 ability with school size having about the same significance as achievement. Results show support for Walberg's productivity factors and school size at the high school level in predicting ability and attainment. The results reaffirm the importance of learning determinants in educational productivity.

Conclusion

The regressions computed on this sample revealed support for school size as a corollary of educational achievement and ability. More emphatic was the finding that Walberg's productivity factors were found to be significant predictors of either educational attainment or ability. Less surprising was the finding that the ability factor predicted both educational attainment and ability.

Discussion

Results of this study support policy-making decisions concerning the closing and/or consolidation of high-schools based on what is needed to equalize pupil enrollment projections. However, based on the findings from the second analysis, school size has impact on the educational attainment of students. Results also reaffirm the impact of background and environmental factors in the educational attainment of students.

That the progress of students at school is strongly related to the standard of education of the parents has already received support in a longitudinal study of secondary schools in England although this research dealt only with immediate learning outcomes. (Smith and Tomlinson,1989). In an earlier study out-of-school contextual variables were cited as highest in ranking of overall sources of influences on learning (Walberg et al, 1990). Most recently the February, 1992 Scientific American, provides evidence that "the U.S. educational crisis is more social than academic." If education appears to operate significantly in the home, perhaps the direction for future research lies in studying aspects of the motivational momentum that is established there, and for exploration of what has been called "the curriculum of the home."

Table 1.

Descriptions and Operational Definitions of Selected NLS Variables with Coding

Aptitude:

Ability (Alpha reliability = .70); vocabulary score (1972), mathematics score (1972).
Achievement 72 (Alpha reliability = .84): high school rank, high school grades: 1 = mostly A (90-100), 2 = about half A and half B (85-89), 3 = mostly B (80-84), 4 = about half B and half C (75-79), 5 = mostly C (70-74), 6 = about half C and half D (65-69), 7 = mostly D (60-64), 8 = mostly below D (less than 60).

Development: age in months.

Motivation (Alpha reliability = .54). Three multiple choice items assessing student's enthusiasm towards school e.g., don't feel part of this school, find it hard to adjust to school, parents aren't interested in education. Items are coded: 1 = strongly agree, 2 = somewhat agree, 3 = disagree.

Instruction:

Quality of instruction (Alpha reliability = .70). Percent of students enrolled in college prep courses. Number of colleges sending representatives. Percent of teachers with advanced degrees. Percent of 1971 graduates who enrolled in college (2 or 4 yr. inst.), number of catalogued volumes in the school library.

Quantity of instruction: one item measuring the amount of homework per week. 1 = none, 2 = don't do it, 3 = less than 5 hours, 4 = between 5 and 10 hours, 5 = more than 10 hours.

Environment:

Home (Alpha reliability = .55). Two questions asked of both parents concerning their aspirations for their child's educational attainment. 1 = quit high school. 2 = graduate high school. 3 = graduate and attend a technical school. 4 = two year college. 5 = four year college. 6 = graduate school. 7 = don't know. One variable measuring lack of a good place to study at home. 1 = agree, 2 = somewhat agree, 3 = disagree.

Classroom (Alpha reliability = .65). Two questions concerning the degree that a particular circumstance has been an obstacle to a students's education, i.e., teachers don't help me enough, poor teaching. 1 = great deal. 2 = somewhat. 3 = not at all. One Likert-type question rating, teacher interest in student. 1 = poor 2 = fair 3 = don't know 4 = good 5 = excellent.

School size (Alpha reliability = .96). Total 1971-72 enrollment. Total number of students graduating, number of full-time teachers. Total number of students graduating from the 12th grade.

Outcome Variables:

Educational attainment 1979 1 = no college, 2 = less than two years, 3 = greater than two years, 4 = B.A./B.S. degree 5 = graduate degree.

Educational Ability, 1979. (Alpha reliability = .71). Consisted of a subset of the base-year test battery including the vocabulary and mathematics items test.

Table 2

(a) Productivity Variables (n=1539)

	Mean	Standard Deviation
Ability (1972)	0.538	0.975
Ability (1979)	0.530	0.886
Age	-0.090	0.886
Motivation	0.023	1.425
Quality	0.055	1.839
Homework	0.047	0.989
Home	0.049	1.296
Classroom	-0.088	1.336
Size	0.580	3.859
Achievement(1972)	0.727	1.034
Achievement(1979)	0.085	1.016

(b) Correlation of variables

Using 1979 Ability as the Outcome

	Ability 72	Age	Motivation	Quality	Quantity	Home	Achieve	Classrm	Size	Ability 79
Ability 1972	1.000									
Age	-.029	1.000								
Motivation	.014	-.006	1.000							
Quality	.020	-.015	.009	1.000						
Homework	.142	-.071	.008	.019	1.000					
Home	.051	-.063	.020	-.005	.026	1.000				
Achievement 1972	.261	-.009	.014	.007	.128	.067	1.000			
Classroom	-.012	.011	-.028	.027	.098	.060	.024	1.000		
Size	.008	-.037	.014	.102	-.009	-.008	.009	-.011	1.000	
Ability 1979	.611	.002	-.001	.013	.118	.086	.227	-.008	.020	1.000

(c) Correlation of variables

Using 1979 Attainment as the Outcome

	Ability 72	Age	Motivation	Quality	Quantity	Abil79	Size	Achieve	Home	Classrm	Attain 79
Ability 1972	1.000										
Age	-.029	1.000									
Motivation	.014	-.006	1.000								
Quality	.020	-.015	.009	1.000							
Homework	.142	-.071	.008	.019	1.000						
Ability 1979	.611	.002	-.001	.013	.118	1.000					
Size	.008	-.037	.014	.102	-.009	.020	1.000				
Achievement 1972	.261	-.009	.014	.007	.128	.227	.009	1.000			
Home	.051	-.063	.020	-.005	.026	.086	-.008	.067	1.000		
Classroom	-.012	.011	-.028	.027	.098	-.008	-.011	.024	.060	1.000	
Attainment 1979	.231	-.176	-.011	.066	.231	.195	.066	.176	.023	.017	1.000

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Table 3

Results of Backward Stepwise Regression

Dependent Variables	F-Value	Begin R²	Ending R²	School Size	Class Room	Home	Motivation	Ach'vement 72	Quality	Development	Abil72	Quantity
Educational Ability 1979	314.74	.38	.38			.052*		.068			.59	
T Value						2.567		3.311			28.362	

Note: Results that appear are significant at the ≤.01 level.
* Beta values reported.

Dependent Variables	F-Value	Begin R²	Ending R²	School Size	Class Room	Home	Motivation	Ach'vement 72	Quality	Development	Abil79	Abil72	Quantity
Educational Achievement 1979	34.81	.138	.134	.05*			.10	.05		-.16	.07	.13	.18
T Value				2.23			4.07	2.104		-6.53	2.32	4.27	7.50

Note: Results that appear are significant at the < .05 level
* Beta values reported.

Table 4

Results of Backward Stepwise Regression

Females=702

Dependent Variables	F-Value	Begin R²	Ending R²	School Size	Class Room	Home	Motivation	Ach'vement 72	Quality	Development	Abil72	Quantity
Math Ability 72*	25.03	.177	.177					.34		-.14		.10
Math Ability 79*	29.38	.23	.228					.307		-.149	.177	.100
Vocab Abil 72	22.73	.142	.140	.08				.30	.13	-.126		
Vocab Abil 79	16.86	.111	.108	.074				.171	.083	-.170	.132	
Ed Attain 79*	30.09	.154	.147					.21		-.14	.17	.12
Ability 79*	127.14	.355	.35					.09			.557	

Males=837

Dependent Variables	F-Value	Begin R²	Ending R²	School Size	Class Room	Home	Motivation	Ach'vement 72	Quality	Development	Abil72	Quantity	Abil79
Math Ability 72	22.26	.100	.100							-.23		.18	
Math Ability 79	41.42	.171	.166				.07			-.24	.23	.17	
Vocab Abil 72	12.1	.104	.102					.19		-.23		.08	
Vocab Abil 79	30.65	.159	.156	.073				.074		-.23	.27		
Ed Attain 79	26.43	.162	.160	.07					.07	-.17	.09	.24	.13
Ability 79	142.44	.408	.406					.065			.60	.062	

Significance reported at <.05 * Significance at <.01

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